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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER	
BERNATZ, KEVIN M	
ART UNIT	**PAPER NUMBER**
1773	

DATE MAILED: 08/19/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/022,728	CHEN ET AL.	
	Examiner	Art Unit	
	Kevin M Bernatz	1773	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1 and 3-19* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1 and 3-19* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

1. Upon reconsideration and partly in view of applicants' arguments in the Appeal Brief filed June 1, 2004, the finality of the rejection of September 30, 2003 is withdrawn and prosecution reopened. The Examiner apologizes for the inconvenience caused by the necessity of the reopening of prosecution. An office action on the merits follows below.

2. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

Claim Rejections - 35 USC § 103

3. Claims 1, 3, 6, 9 and 11 - 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bian et al. (U.S. Patent No. 6,593,009 B2) in view of Lal et al. (U.S. Patent No. 5,849,386).

Regarding claims 1 and 11, Bian et al. ('009 B2) disclose a method of making a magnetic recording medium (*Title*) comprising a non-magnetic substrate (*Figure 3, element 26*), depositing a B-2 structured ruthenium-aluminum-containing underlayer comprising a (200) crystallographic orientation on the non-magnetic substrate (*element 32; col. 2, lines 52 – 57; col. 3, lines 48 – 50; and col. 4, lines 60 – 61*), and depositing a magnetic layer comprising a Co(11.0) crystallographic orientation on the B-2 structured ruthenium-aluminum-containing underlayer (*element 34 and col. 4, lines 60 – 62*),

wherein the magnetic recording medium is an oriented medium (*col. 2, lines 28 – 32 and lines 48 – 52 and col. 4, lines 62 – 64: "good in-plane orientation which is desirable for longitudinal magnetic recording"*). The Examiner notes that Bian et al. ('009 B2) disclose the invention as a magnetic disk (*col. 3, lines 51 – 55*) wherein a high degree of in-plane orientation is desired for longitudinal recording (*col. 4, lines 62 – 64*).

Bian et al. ('009 B2) fail to disclose mechanically texturing the non-magnetic substrate, nor the orientation ratio of the magnetic moment (OR-Mrt) of the recording medium. The Examiner notes that OR-Mr and OR-Mrt are the same, since t is the thickness of the layer and is identical for the radial and the circumferential directions (i.e. $Mr_{circumferential} * t / Mr_{radial} * t = Mr_{circumferential} / Mr_{radial}$).

However, Lal et al. teach "longitudinal magnetic recording media of the type for use in computer disc drives" (*col. 1, lines 49 – 51*) comprising a "nickel-phosphorus-coated aluminum substrate which has been circumferentially textured" (*col. 1, lines 53 – 55 and col. 4, lines 1 - 17*) which are characterized by the orientation ratio, wherein the "orientation ratio is the ratio of either Mr, Hc or S*, in the tangential or in-plane circumferential direction to values in the radial direction" (*col. 1, lines 56 – 67*). Lal et al. further disclose that "which orientation ratio value reported is often a function of convenience" and that "media prepared as described above typically have a higher magnetic remanence, coercivity or coercive squareness in the in-plane circumferential direction compared to the radial direction. Such media are referred to as "oriented" or "anisotropic" and are characterized by having an orientation ratio value unequal to one. For anisotropic media prepared on a circumferentially textured substrate, the orientation

ratio can be as high as ten, although typical values are between about 1.1 to 1.5" (*col. 2, lines 1 – 16*).

It would therefore have been obvious to one of ordinary skill in the art at the time of the applicant's invention to modify the longitudinal recording medium of Bian et al. ('009 B2) to use a circumferentially oriented substrate with an OR-Mrt value more than about 1.05 as taught by Lal et al., since Lal et al. teach that such a substrate leads to OR values exceeding applicants' claimed minimum value and indicate a high degree of in-plane circumferential orientation, which is desired by Bian et al. for longitudinal recording.

Regarding claims 3 and 12, Bian et al. ('009 B2) disclose Ru-Al layers meeting applicants' claimed composition limitations (*col. 3, lines 48 – 50*).

Regarding claims 6, 13 and 14, Bian et al. ('009 B2) disclose underlayer and onset (i.e. "intermediate") layers meeting applicants' claimed structural and material limitations (*Figure 3, elements 33 and 37 and col. 3, lines 26 - 60*).

Regarding claims 9 and 15, Bian et al. ('009 B2) disclose magnetic layers meeting applicants' material limitations (*examples*).

4. Claims 4, 5, 17 and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bian et al. ('009 B2) in view of Lal et al. as applied above, and further in view of Chen et al. (WO 98/16923) and Abarra et al. (U.S. Patent No. 6,613,460 B1).

Regarding claims 4 and 17, Bian et al. ('009 B2) and Lal et al. are relied upon as described above. Bian et al. ('009 B2) further disclose using non-magnetic substrates (*col. 2, lines 29 – 30*).

Neither Bian et al. ('009 B2) nor Lal et al. disclose oxidizing the textured NiP layer.

However, Chen et al. (WO '923) teach that sputter depositing an oxidized NiP layer to be used under an underlayer with a (200) crystallographic orientation results in a magnetic recording medium "enjoying the advantages derived from a small grain size ... underlayer while achieving low medium noise and high coercivity suitable for high density longitudinal magnetic recording" (*page 6, lines 15 – 20; page 7, lines 1 – 10; page 8, lines 22 – 34; and page 16, lines 18 - 20*). Abarra et al. provides explicit teaching that it is known in the longitudinal recording art that "the NiP layer ... is preferably oxidized and/or mechanically textured" (*col. 1, lines 7 – 11 and col. 4, lines 14 – 20*).

It would therefore have been obvious to one of ordinary skill in the art at the time of the applicant's invention to modify the device of Bian et al. ('009 B2) in view of Lal et al. to include an oxidized NiP layer as taught by Chen et al., since such an oxidized NiP layer results in a magnetic recording medium "enjoying the advantages derived from a small grain size ... underlayer while achieving low medium noise and high coercivity suitable for high density longitudinal magnetic recording".

Regarding claims 5 and 18, Bian et al. ('009 B2) disclose that Al-alloy substrates with an electrolessly plated NiP layer are known in the art (*col. 1, lines 41 – 43*) and

Abarra et al. teach that they are equivalent substrates for use in longitudinal media under oxidized and/or mechanically textured NiP layers (*col. 4, lines 6 – 8*). It would therefore have been obvious to one of ordinary skill in the art at the time of applicants' invention to use a Al-alloy substrate instead of the glass substrate including an electrolessly plated NiP layer since using Al or glass substrates under an NiP layer are known equivalent structures in the art.

5. Claims 7, 8 and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bian et al. ('009 B2) in view of Lal et al., Chen et al. (WO '923) and Abarra et al. as applied above, and further in view of Chen et al. (U.S. Patent No. 5,866,227).

Bian et al. ('009 B2), Lal et al., Chen et al. (WO '923) and Abarra et al. are relied upon as disclosed above. Chen et al. (WO '923) further disclose thickness values meeting applicants' claimed limitations (<u>claim 8</u>) and that the thickness of the NiP layer exceeds 50 Å (*page 10, lines 5 – 7*), thereby necessarily meeting the claimed limitation regarding oxygen being present in the top 50 Å of the oxidized NiP film. Finally, Chen et al. disclose using NiP meeting applicants' claimed phosphorus amount (*Table 4*).

None of above disclose the oxygen content in the NiP film.

However, Chen et al. ('227) teach that when forming partially oxidized NiP films for the same advantageous use disclosed by Chen et al. (WO ' 923), that the films preferably contain an amount of phosphorous and oxygen meeting applicants' claimed limitations (*col. 7, lines 39 – 42*).

It would therefore have been obvious to one of ordinary skill in the art at the time of the applicant's invention to modify the device of Bian et al. ('009 B2) in view of Lal et al, Chen et al. (WO '923) and Abarra et al. to possess an amount of oxygen and phosphorous meeting applicants' claimed composition limitations as taught by Chen et al. ('227) since such a composition allows the Chen et al. (WO '923) benefits to be achieved.

6. Claims 10 and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bian et al. ('009 B2) in view of Lal et al. as applied above, and further in view of Bian et al. (U.S. Patent No. 6,586,116 B1).

Bian et al. ('009 B2) and Lal et al. are relied upon as described above.

Neither of the above disclose the thickness of the Ru-Al layer

However, Bian et al. ('116 B1) teach that in longitudinal recording media, when using a thin Ru-Al layer above a pre-seed layer (as done in Bian et al. '009 B2), the thickness of the Ru-Al layer is not critical, but gives values meeting applicants' claimed range (*col. 7, lines 18 –19*).

It would therefore have been obvious to one of ordinary skill in the art at the time of the applicant's invention to modify the device of Bian et al. ('009 B2) in view of Lal et al. to use a Ru-Al layer meeting applicants' claimed thickness values as taught by Bian et al. ('116 B1), since the thickness of the Ru-Al layer is not overly critical to practicing the claimed invention and using a layer meeting applicants' claimed limitations is taught

by Bian et al. ('116 B1) as suitable for practicing longitudinal recording while avoiding the expensive of a thick Ru-based layer (*col. 2, lines 61 – 64*).

7. Claims 1, 3, 6 and 9 – 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bian et al. (U.S. Patent No. 6,586,116 B1) in view of Lal et al. ('386).

Regarding claims 1 and 11, Bian et al. ('116 B1) disclose a method of making a magnetic recording medium (*Title*) comprising a non-magnetic substrate (*Figure 2, element 10*), depositing a B-2 structured ruthenium-aluminum-containing underlayer comprising a (200) crystallographic orientation on the non-magnetic substrate (*element 12 and claims 1 and 2*), and depositing a magnetic layer comprising a Co(11.0) crystallographic orientation on the B-2 structured ruthenium-aluminum-containing underlayer (*element 15 and col. 4, lines 61 – 65*), wherein the magnetic recording medium is an oriented medium (*col. 2, lines 56 – 58 and col. 4, lines 61 – 66: "significant improvement of the C-axis in-plane orientation"*). The Examiner notes that Bian et al. ('116 B1) disclose the invention as a magnetic disk (*col. 4, lines 33 – 43*) wherein a high degree of in-plane orientation is desired for longitudinal recording (*col. 4, lines 61 – 66*).

Bian et al. ('116 B1) fail to disclose mechanically texturing the non-magnetic substrate, nor the orientation ratio of the magnetic moment (OR-Mrt) of the recording medium. The Examiner notes that OR-Mr and OR-Mrt are the same, since t is the thickness of the layer and is identical for the radial and the circumferential directions (i.e. $Mr_{circumferential} * t / Mr_{radial} * t = Mr_{circumferential} / Mr_{radial}$).

However, Lal et al. teach "longitudinal magnetic recording media of the type for use in computer disc drives" (*col. 1, lines 49 – 51*) comprising a "nickel-phosphorus-coated aluminum substrate which has been circumferentially textured" (*col. 1, lines 53 – 55 and col. 4, lines 1 - 17*) which are characterized by the orientation ratio, wherein the "orientation ratio is the ratio of either Mr, Hc or S*, in the tangential or in-plane circumferential direction to values in the radial direction" (*col. 1, lines 56 – 67*). Lal et al. further disclose that "which orientation ratio value reported is often a function of convenience" and that "media prepared as described above typically have a higher magnetic remanence, coercivity or coercive squareness in the in-plane circumferential direction compared to the radial direction. Such media are referred to as "oriented" or "anisotropic" and are characterized by having an orientation ratio value unequal to one. For anisotropic media prepared on a circumferentially textured substrate, the orientation ratio can be as high as ten, although typical values are between about 1.1 to 1.5" (*col. 2, lines 1 – 16*).

It would therefore have been obvious to one of ordinary skill in the art at the time of the applicant's invention to modify the longitudinal recording medium of Bian et al. ('116 B1) to use a circumferentially oriented substrate with an OR-Mrt value more than about 1.05 as taught by Lal et al., since Lal et al. teach that such a substrate leads to OR values exceeding applicants' claimed minimum value and indicate a high degree of in-plane circumferential orientation, which is desired by Bian et al. ('116 B1) for longitudinal recording.

Regarding claims 3 and 12, Bian et al. ('116 B1) disclose Ru-Al layers meeting applicants' claimed composition limitations (*Table 1 and col. 4, lines 34 - 35*).

Regarding claims 6, 13 and 14, Bian et al. ('116 B1) disclose underlayer and onset (i.e. "intermediate") layers meeting applicants' claimed structural and material limitations (*Figure 2, elements 13 and 14 and col. 6, lines 33 - 65*).

Regarding claims 9 and 15, Bian et al. ('116 B1) disclose magnetic layers meeting applicants' material limitations (*col. 6, line 65 bridging col. 7, line 1 and examples*).

Regarding claims 10 and 16, Bian et al. ('116 B1) disclose Ru-Al layer thickness values meeting applicants' claimed limitations (*col. 7, lines 18 – 19*).

8. Claims 1, 3 – 6 and 9 - 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chen et al. (U.S. Patent No. 6,596,419 B1) in view of Lal et al. ('386), Abarra et al. ('460 B1) and Ueno (U.S. Patent No. 6,159,625). The provisional application (60/236,011) which Chen et al. ('419 B1) is based on has been provided to support the use of the effective filing date of 9/27/2000.

Regarding claims 1 and 11, Chen et al. ('419 B1) disclose a method of making a magnetic recording medium (*Title*) comprising a non-magnetic substrate (*Figure 3, element 31*), depositing a B-2 structured underlayer comprising a (200) crystallographic orientation on the non-magnetic substrate (*element 33 and col. 5, lines 7 - 9*), and depositing a magnetic layer comprising a Co(11.0) crystallographic orientation on the B-2 structured underlayer (*element 36 and col. 5, lines 9 – 13*), wherein the magnetic

recording medium is an oriented medium (*col. 2, lines 38 – 41 and col. 6, lines 56 – 61: "enhance the development of ... Co(11.0) crystallographic orientation"*). The Examiner notes that Chen et al. ('419 B1) disclose the invention as a magnetic disk (*col. 4, lines 49 - 51*) wherein a high degree of in-plane orientation is desired for longitudinal recording (*col. 1, lines 8 – 17 and col. 6, lines 56 - 61*).

Chen et al. ('419 B1) fail to disclose mechanically texturing the non-magnetic substrate, nor the orientation ratio of the magnetic moment (OR-Mrt) of the recording medium. The Examiner notes that OR-Mr and OR-Mrt are the same, since t is the thickness of the layer and is identical for the radial and the circumferential directions (i.e. $Mr_{circumferential} * t / Mr_{radial} * t = Mr_{circumferential} / Mr_{radial}$).

However, Lal et al. teach "longitudinal magnetic recording media of the type for use in computer disc drives" (*col. 1, lines 49 – 51*) comprising a "nickel-phosphorus-coated aluminum substrate which has been circumferentially textured" (*col. 1, lines 53 – 55 and col. 4, lines 1 - 17*) which are characterized by the orientation ratio, wherein the "orientation ratio is the ratio of either Mr, Hc or S*, in the tangential or in-plane circumferential direction to values in the radial direction" (*col. 1, lines 56 – 67*). Lal et al. further disclose that "which orientation ratio value reported is often a function of convenience" and that "media prepared as described above typically have a higher magnetic remanence, coercivity or coercive squareness in the in-plane circumferential direction compared to the radial direction. Such media are referred to as "oriented" or "anisotropic" and are characterized by having an orientation ratio value unequal to one. For anisotropic media prepared on a circumferentially textured substrate, the orientation

ratio can be as high as ten, although typical values are between about 1.1 to 1.5" (*col. 2, lines 1 – 16*). While Chen et al. ('419 B1) teach an oxidized NiP layer, the Examiner notes that Abarra et al. provides explicit teaching that it is known in the longitudinal recording art that "the NiP layer ... is preferably oxidized and/or mechanically textured" (*col. 1, lines 7 – 11 and col. 4, lines 14 – 20*).

It would therefore have been obvious to one of ordinary skill in the art at the time of the applicant's invention to modify the longitudinal recording medium of Chen et al. ('419 B1) to use a circumferentially oriented substrate with an OR-Mrt value more than about 1.05 as taught by Lal et al., since Lal et al. teach that such a substrate leads to OR values exceeding applicants' claimed minimum value and indicate a high degree of in-plane circumferential orientation, which is desired by Chen et al. ('419 B1) for longitudinal recording.

Neither Chen et al. ('419 B1) nor Lal et al. teach using a Ru-Al B2-structured underlayer. However, the Examiner notes that Ru-Al is a known B2 alloy, as taught by Ueno (*col. 3, lines 23 – 37*) and the substitution of a B2 Ru-Al alloy for the B2-structured CoTi alloy would have been within the knowledge of one of ordinary skill in the art since there would be a reasonable expectation that similar structured alloys would behave in an identical manner.

Regarding claims 3 and 12, Ueno disclose Ru-Al layers meeting applicants' claimed composition limitations for forming B2-structured layers (*col. 3, lines 23 – 37 and examples*).

Regarding claims 4, 5, 17 and 18, Chen et al. ('419 B1) disclose oxidized NiP layers and substrates meeting applicants' claimed structural and composition limitations (*col. 4, line 61 bridging col. 5, line 2; col. 6, lines 6 – 9 and lines 30 – 23*).

Regarding claims 6, 13 and 14, Chen et al. ('419 B1) disclose underlayer and onset (i.e. "intermediate") layers meeting applicants' claimed structural and material limitations (*Figure 3, elements 34 and 34 and col. 5, lines 30 - 58*).

Regarding claims 9 and 15, Chen et al. ('419 B1) disclose magnetic layers meeting applicants' material limitations (*col. 5, lines 26 - 29*).

Regarding claims 10 and 16, Chen et al. ('419 B1) disclose B2-structured layer thickness values meeting applicants' claimed limitations (*col. 6, lines 23 - 26*).

9. Claims 7, 8 and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chen et al. ('419 B1) in view of Lal et al., Abarra et al. and Ueno as applied above, and further in view of Chen et al. ('227).

Chen et al. ('419 B1), Lal et al. and Abarra et al. are relied upon as disclosed above. Chen et al. ('419 B1) further disclose thickness values meeting applicants' claimed limitations (claim 8) and that the thickness of the NiP layer exceeds 50 Å (*col. 6, lines 19 - 24*), thereby necessarily meeting the claimed limitation regarding oxygen being present in the top 50 Å of the oxidized NiP film. Finally, Chen et al. ('419 B1) disclose using NiP meeting applicants' claimed phosphorus amount (*col. 5, lines 30 - 31*).

None of above disclose the oxygen content in the NiP film.

However, Chen et al. ('227) teach that when forming partially oxidized NiP films for the same advantageous use disclosed by Chen et al. ('419 B1), that the films preferably contain an amount of phosphorous and oxygen meeting applicants' claimed limitations (*col. 7, lines 39 – 42*).

It would therefore have been obvious to one of ordinary skill in the art at the time of the applicant's invention to modify the device of Chen et al. ('419 B1) in view of Lal et al. and Abarra et al. to possess an amount of oxygen and phosphorous meeting applicants' claimed composition limitations as taught by Chen et al. ('227) since such a composition allows the Chen et al. ('419 B1) benefits to be achieved.

Response to Arguments

10. The rejection of claims 1 and 3 - 19 under 35 U.S.C § 103(a) – Bian et al. ('009 B2) in view of Lal et al., alone or in combination with various references

The rejection of claims 1, 3, 6 and 9 – 16 under 35 U.S.C § 103(a) – Bian et al. ('116 B1) in view of Lal et al.

The rejection of claims 1 and 3 - 19 under 35 U.S.C § 103(a) – Chen et al. ('419 B1) in view of Lal et al. and Ueno

Applicant's arguments have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

11. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kevin M Bernatz whose telephone number is (571) 272-1505. The examiner can normally be reached on M-F, 9:00 AM - 6:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Deborah Jones can be reached on (571) 272-1535. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Kevin M. Bernatz, PhD.
Primary Examiner

August 3, 2004